

HAWAII ADMINISTRATIVE RULES

TITLE 12

DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

SUBTITLE 8

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH

PART 3

CONSTRUCTION STANDARDS

CHAPTER 152

CRITERIA FOR DESIGN AND CONSTRUCTION OF SPRAY BOOTHS

§12-152-1 Incorporation of federal standard

§12-152-2 Definitions

§12-152-1 Incorporation of federal standard. Title 29, Code of Federal Regulations, section 1926.66, entitled "Criteria for Design and Construction of Spray Booths", published by the Office of the Federal Register, National Archives and Records Administration, on June 30, 1993, is made a part of this chapter, except as provided in section 12-152-2.
[Eff 8/10/95] (Auth: HRS §396-4) (Imp: HRS §396-4)

§1926.66 Criteria for design and construction of spray booths.

(a) Definitions applicable to this section

- (1) **Aerated solid powders.** Aerated powders shall mean any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations.
- (2) **Spraying area.** Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.
- (3) **Spray booth.** A power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system.
- (4) **Waterwash spray booth.** A spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.
- (5) **Dry spray booth.** A spray booth not equipped with a water washing system as described in paragraph (a)(4) of this section. A dry spray booth may be equipped with
 - (i) Distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct; or
 - (ii) Overspray dry filters to minimize dusts; or
 - (iii) Overspray dry filters to minimize dusts or residues entering exhaust ducts; or
 - (iv) Overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or
 - (v) Where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.
- (6) **Fluidized bed.** A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.
- (7) **Electrostatic fluidized bed.** A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported, through the container immediately above the charged and aerated materials in order to be coated.
- (8) **Approved.** Shall mean approved and listed by a nationally recognized testing laboratory.
- (9) **Listed.** See "approved" in paragraph (a)(8) of this section.

(b) Spray booths

- (1) **Construction.** Spray booths shall be substantially constructed of steel, securely and rigidly supported, or of concrete or masonry except that aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying. Spray booths shall be designed to sweep air currents toward the exhaust outlet.
- (2) **Interiors.** The interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.
- (3) **Floors.** The floor surface of a spray booth and operator's working area, if combustible, shall be covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.
- (4) **Distribution or baffle plates.** Distribution or baffle plates, if installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct, shall be of noncombustible material and readily removable or accessible on both sides for cleaning. Such plates shall not be located in exhaust ducts.
- (5) **Dry type overspray collectors - (exhaust air filters).** In conventional dry type spray booths, overspray dry filters or filter rolls, if installed, shall conform to the following:
 - (i) The spraying operations except electrostatic spraying operations shall be so designed, installed and maintained that the average air velocity over the open face of the booth (or booth cross section during spraying operations) shall be not less than 100 linear feet per

minute. Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear feet per minute, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics. Visible gauges or audible alarm or pressure-activated devices shall be installed to indicate or insure that the required air velocity is maintained. Filter rolls shall be inspected to insure proper replacement of filter media.

- (ii) All discarded filter pads and filter rolls shall be immediately removed to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely in water.
 - (iii) The location of filters in a spray booth shall be so as to not reduce the effective booth enclosure of the articles being sprayed.
 - (iv) Space within the spray booth on the downstream and upstream sides of filters shall be protected with approved automatic sprinklers.
 - (v) Filters or filter rolls shall not be used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.
 - (vi) Clean filters or filter rolls shall be noncombustible or of a type having a combustibility not in excess of class 2 filters as listed by Underwriters' Laboratories, Inc. Filters and filter rolls shall not be alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition.
- (6) Frontal area. Each spray booth having a frontal area larger than 9 square feet shall have a metal deflector or curtain not less than 2-1/2 inches (5.35 cm) deep installed at the upper outer edge of the booth over the opening.
 - (7) Conveyors. Where conveyors are arranged to carry work into or out of spray booths, the openings therefore shall be as small as practical.
 - (8) Separation of operations. Each spray booth shall be separated from other operations by not less than 3 feet (0.912 m), or by a greater distance, or by such partition or wall as to reduce the danger from juxtaposition of hazardous operations. See also paragraph (c)(1) of this section.
 - (9) Cleaning. Spray booths shall be so installed that all portions are readily accessible for cleaning. A clear space of not less than 3 feet (0.912 m) on all sides shall be kept free from storage or combustible construction.
 - (10) Illumination. When spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units shall be used as a source of illumination. Panels shall effectively isolate the spraying area from the area in which the lighting unit is located, and shall be of a noncombustible material of such a nature or so protected that breakage will be unlikely. Panels shall be so arranged that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.
- (c) Electrical and other sources of ignition**
- (1) Conformance. All electrical equipment, open flames and other sources of ignition shall conform to the requirements of this paragraph, except as follows:
 - (i) Electrostatic apparatus shall conform to the requirements of paragraphs (e) and (f) of this section;
 - (ii) Drying, curing, and fusion apparatus shall conform to the requirements of paragraph (g) of this section;
 - (iii) [Reserved]
 - (iv) Powder coating equipment shall conform to the requirements of paragraph (c)(1) of this section.
 - (2) Minimum separation. There shall be no open flame or spark producing equipment in any spraying area nor within 20 feet (6.08 m) thereof, unless separated by a partition.
 - (3) Hot surfaces. Space-heating appliances, steam pipes, or hot surfaces shall not be located in a spraying area where deposits of combustible residues may readily accumulate.
 - (4) Wiring conformance. Electrical wiring and equipment shall conform to the provisions of this paragraph and shall otherwise be in accordance with subpart S of this part.
 - (5) Combustible residues, areas. Unless specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors, there shall be no electrical

equipment in any spraying area, whereon deposits of combustible residues may readily accumulate, except wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.

- (6) Wiring type approved. Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area as herein defined shall be of explosion-proof type approved for Class I, group D locations and shall otherwise conform to the provisions of subpart S of this part, for Class I, Division 1, Hazardous Locations. Electrical wiring, motors, and other equipment outside of but within 20 feet (6.08 m) of any spraying area, and not separated therefrom by partitions, shall not produce sparks under normal operating conditions and shall otherwise conform to the provisions of subpart S of this part for Class I, Division 2 Hazardous Locations.
- (7) Lamps. Electric lamps outside of, but within 20 feet (6.08 m) of any spraying area, and not separated therefrom by a partition, shall be totally enclosed to prevent the falling of hot particles and shall be protected from mechanical injury by suitable guards or by location.
- (8) Portable lamps. Portable electric lamps shall not be used in any spraying area during spraying operations. Portable electric lamps, if used during cleaning or repairing operations, shall be of the type approved for hazardous Class I locations.
- (9) Grounding.
 - (i) All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids shall be properly electrically grounded in an effective and permanent manner.

(d) Ventilation

- (1) Conformance. Ventilating and exhaust systems shall be in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961, where applicable and shall also conform to the provisions of this section.
- (2) General. All spraying areas shall be provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life is not endangered. Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.
- (3) Independent exhaust. Each spray booth shall have an independent exhaust duct system discharging to the exterior of the building, except that multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust. If more than one fan serves one booth, all fans shall be so interconnected that one fan cannot operate without all fans being operated.
- (4) Fan-rotating element. The fan-rotating element shall be nonferrous or non-sparking or the casing shall consist of or be lined with such material. There shall be ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction, necessary allowance being made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded, the shaft preferably to have bearings outside the duct and booth. All bearings shall be of the self-lubricating type, or lubricated from the outside duct.
- (5) Electric motors. Electric motors driving exhaust fans shall not be placed inside booths or ducts. See also paragraph (c) of this section.
- (6) Belts. Belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed.
- (7) Exhaust ducts. Exhaust ducts shall be constructed of steel and shall be substantially supported. Exhaust ducts without dampers are preferred; however, if dampers are installed, they shall be maintained so that they will be in a full open position at all times the ventilating system is in operation.
 - (i) Exhaust ducts shall be protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 inches (45.72 cm).
 - (ii) If combustible construction is provided with the following protection applied to all surfaces within 18 inches (45.72 cm), clearances may be reduced to the distances indicated:

- (a) 28-gage sheet metal on 1/4-inch asbestos millboard. 12 inches (30.48 cm).
 - (b) 28-gage sheet metal on 1/8-inch asbestos millboard spaced out 1 inch (2.54 cm) on noncombustible spacers. 9 inches (22.86 cm).
 - (c) 22-gage sheet metal on 1-inch rockwool batts reinforced with wire mesh or the equivalent. 3 inches (7.62 cm).
 - (d) Where ducts are protected with an approved automatic sprinkler system, properly maintained, the clearance required in paragraph (d)(7)(i) of this section may be reduced to 6 inches (15.24 cm).
- (8) Discharge clearance. Unless the spray booth exhaust duct terminal is from a water-wash spray booth, the terminal discharge point shall be not less than 6 feet from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet (7.6 m).
- (9) Air exhaust. Air exhaust from spray operations shall not be directed so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes, nor directed so as to create a nuisance. Air exhausted from spray operations shall not be re-circulated.
- (10) Access doors. When necessary to facilitate cleaning, exhaust ducts shall be provided with an ample number of access doors.
- (11) Room intakes. Air intake openings to rooms containing spray-finishing operations shall be adequate for the efficient operation of exhaust fans and shall be so located as to minimize the creation of dead air pockets.
- (12) Drying spaces. Freshly sprayed articles shall be dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors. In the event adequate and reliable ventilation is not provided such drying spaces shall be considered a spraying area.
- (e) Fixed electrostatic apparatus.
 - (1) Conformance. Where installation and use of electrostatic spraying equipment is used, such installation and use shall conform to all other paragraphs of this section, and shall also conform to the requirements of this paragraph.
 - (2) Type approval. Electrostatic apparatus and devices used in connection with coating operations shall be of approved types.
 - (3) Location. Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, shall be located outside of the spraying area, or shall otherwise conform to the requirements of paragraph (c) of this section.
 - (4) Support. Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from the ground. Electrodes and electrostatic atomizing heads that are permanently attached to their bases, supports, or reciprocators, shall be deemed to comply with this section. Insulators shall be nonporous and noncombustible.
 - (5) Insulators, grounding. High-voltage leads to electrodes shall be properly insulated and protected from mechanical injury or exposure to destructive chemicals. Electrostatic atomizing heads shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding the electrode system when it is electrically de-energized for any reason. All insulators shall be kept clean and dry.
 - (6) Safe distance. A safe distance shall be maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the

- assembly.
- (7) Conveyors required. Goods being painted using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent such swinging or movement that would reduce the clearance to less than that specified in paragraph (e)(6) of this section.
 - (8) Prohibition. This process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment that is manipulated by hand, see paragraph (f) of this section for applicable requirements.
 - (9) Fail-safe controls. Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:
 - (i) Stoppage of ventilating fans or failure of ventilating equipment from any cause.
 - (ii) Stoppage of the conveyor carrying goods through the high voltage field.
 - (iii) Occurrence of a ground or of an imminent ground at any point on the high voltage system.
 - (iv) Reduction of clearance below that specified in paragraph (e)(6) of this section.
 - (10) Guarding. Adequate booths, fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing, and guards shall be of conducting material, adequately grounded.
 - (11) Ventilation. Where electrostatic atomization is used the spraying area shall be so ventilated as to insure safe conditions from a fire and health standpoint.
 - (12) Fire protection. All areas used for spraying, including the interior of the booth, shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.
- (f) Electrostatic hand spraying equipment.
- (1) Application. This paragraph shall apply to any equipment using electrostatically charged elements for the atomization and/or, precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.
 - (2) Conformance. Electrostatic hand spraying equipment shall conform to the other provisions of this section.
 - (3) Equipment approval and specifications. Electrostatic hand spray apparatus and devices used in connection with coating operations shall be of approved types. The high voltage circuits shall be designed so as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the handgun shall be capable of being energized only by a switch that also controls the coating material supply.
 - (4) Electrical support equipment. Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself and its connections to the power supply shall be located outside of the spraying area or shall otherwise conform to the requirements of paragraph (c) of this section.
 - (5) Spray gun ground. The handle of the spraying gun shall be electrically connected to ground by a metallic connection and to be so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.
 - (6) Grounding-general. All electrically conductive objects in the spraying area shall be adequately grounded. This requirement shall apply to paint containers, wash cans, and any other objects or devices in the area. The equipment shall carry a prominent permanently installed warning regarding the necessity for this grounding feature.
 - (7) Maintenance of grounds. Objects being painted or coated shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to insure this contact and areas of contact shall be sharp points or knife-edges where possible. Points of support of the object shall be concealed from random spray where feasible and

- where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be so located as to not collect spray material during normal operation.
- (8) Interlocks. The electrical equipment shall be so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.
 - (9) Ventilation. The spraying operation shall take place within a spray area that is adequately ventilated to remove solvent vapors released from the operation.
- (g) Drying, curing, or fusion apparatus.
- (1) Conformance. Drying, curing, or fusion apparatus in connection with spray application of flammable and combustible finishes shall conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, where applicable and shall also conform with the following requirements of this paragraph.
 - (2) Alternate use prohibited. Spray booths, rooms, or other enclosures used for spraying operations shall not alternately be used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.
 - (3) Adjacent system interlocked. Except as specifically provided in paragraph (g)(4) of this section, drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks shall not be installed in a spraying area, but may be installed adjacent thereto when equipped with an interlocked ventilating system arranged to:
 - (i) Thoroughly ventilate the drying space before the heating system can be started;
 - (ii) Maintain a safe atmosphere at any source of ignition;
 - (iii) Automatically shut down the heating system in the event of failure of the ventilating system.
 - (4) Alternate use permitted. Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus when conforming to the following:
 - (i) Interior (especially floors) of spray enclosures shall be kept free of overspray deposits.
 - (ii) During spray operations, the drying apparatus and electrical connections and wiring thereto shall not be located within spray enclosure nor in any other location where spray residues may be deposited thereon.
 - (iii) The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:
 - (a) The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.
 - (b) The spray enclosure will be purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized.
 - (c) The ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus will automatically shut off in the event of failure of the ventilating system.
 - (iv) All electrical wiring and equipment of the drying apparatus shall conform to the applicable sections of Subpart S of this part. Only equipment of a type approved for Class I, Division 2 hazardous locations shall be located within 18 inches (45.72 cm) of floor level. All metallic parts of the drying apparatus shall be properly electrically bonded and grounded.
 - (v) The drying apparatus shall contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus.

§12-152-2 Definitions. As used in 29 CFR 1926.66 and applied to this chapter:

"Subpart S" means chapter 12-141.1. [Eff 8/10/95; am 2/8/97]
(Auth: HRS §396-4) (Imp: HRS §396-4)